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77 USPQ2d 1140**IPXL Holdings LLC v. Amazon.com Inc.****U.S. Court of Appeals
Federal Circuit**

Nos. 05-1009, -1487

Decided November 21, 2005

Headnotes**PATENTS****[1] Patentability/Validity — Construction of claims (►115.03)****Patentability/Validity — Anticipation — Identity of elements (►115.0704)**

Prior art patent directed to automated teller machine meets "single screen" limitation of asserted claims of patent for electronic fund transfer system, which requires presentation of "stored transaction information" to user on one screen without user having to encounter any preliminary screens that would require user to select "transaction type" or "transaction parameter," since prior patent discloses screen displaying stored transaction information required by claims, since "lead through display" of prior patent does not require navigation through series of screens, or entry of transaction information before single screen displays plurality of predicted transactions, since prior patent clearly discloses display of multiple transaction types and parameters, and since prior patent allows user to select one of variety of transaction options, and thus enables user to "enter selections to specify one or more transaction parameters" as required by claims.

[2] Patentability/Validity — Specification — Claim adequacy (►115.1109)

Recitation of both apparatus and method of using that apparatus in same claim renders claim indefinite under 35 U.S.C. §112, since such claim is not sufficiently precise to provide competitors with accurate determination of "metes and bounds" of protection involved; in present case, claim in patent for electronic fund transfer system is indefinite under foregoing rule, since claim recites both system disclosed in prior claim and method of using that system, and thus does not apprise person of ordinary skill in art of its scope.

REMEDIES**[3] Monetary — Attorneys' fees; costs — Patents — In general (►510.0905.01)**

Federal district court's award of attorneys' fees to prevailing defendant under 35 U.S.C. §285 must be reversed, since motions for attorneys' fees under Section 285 must be filed no later than 14 days after entry of judgment in accordance with Fed. R. Civ. P. 54(d)(2)(B), whereas defendant's motion was filed 17 days after entry of judgment, and since defendant did not move for enlargement of time under Fed. R. Civ. P. 6(b)(2) after 14-day time period had run.

Particular Patents**Particular patents — Electrical — Electronic fund transfers**

6,149,055, Gatto, electronic fund transfer or transaction system, summary judgment of invalidity affirmed.

Case History and Disposition

Appeal from the U.S. District Court for the Eastern District of Virginia, Brinkema, J.; 72 USPQ2d 1469.

Action by IPXL Holdings LLC against Amazon.com Inc. for patent infringement, in which defendant counterclaimed for declaratory judgment of noninfringement and invalidity. Plaintiff appeals from summary judgment of invalidity and noninfringement, and from award of attorneys' fees to defendant. Summary judgment of invalidity affirmed; award of attorneys' fees reversed.

Attorneys

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David K. Callahan, Thomas G. Pasternak, and David Rokach, of Kirkland & Ellis, Chicago, Ill.; Edward C. Donovan, of Kirkland & Ellis, Washington, D.C.; Christine E. Duh and David S. Olson, of Kirkland & Ellis, San Francisco, Calif., for defendant-appellee.

Judge

Before Clevenger, Rader, and Schall, circuit judges.

Opinion Text

Opinion By:

Clevenger, J.

Plaintiff-appellant IPXL Holdings, L.L.C. ("IPXL") appeals the judgment of the United States District Court for the Eastern District of

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Virginia granting summary judgment in favor of Defendant-appellee Amazon.com, Inc. ("Amazon"), see *IPXL Holdings, L.L.C. v. Amazon.com, Inc.*, 333 F.Supp.2d 513 [72 USPQ2d 1469] (E.D. Va. 2004) ("Summary Judgment"), and awarding Amazon attorney fees, see *IPXL Holdings, L.L.C. v. Amazon.com, Inc.*, No. 04-CV-70 (E.D. Va. Sept. 24, 2004) ("Attorney Fees"). IPXL sued Amazon, alleging that Amazon's "1-click system" infringed claims 1, 2, 9, 15 and 25 of its U.S. Patent No. 6,149,055 ("the '055 patent"). The district court found that Amazon's system did not infringe the '055 patent and that all relevant claims were invalid. Finding that the case was "exceptional," the district court awarded Amazon attorney fees and costs under 35 U.S.C. §285. Because we agree that claims 1, 2, 9, 15 and 25 are invalid, we affirm the district court's grant of summary judgment on invalidity and need not reach its ruling on noninfringement. However, because Amazon did not timely file its motion for attorney fees under Fed. R. Civ. P. 54(d)(2)(B), we reverse the district court's grant of attorney fees and costs.

I

The '055 patent, entitled "Electronic Fund Transfer or Transaction System," is directed to a system for executing electronic financial transactions, such as an electronic fund transfer system, including automated teller machines ("ATMs") or point of sale ("POS") terminals. The essence of the '055 patent is that the system stores information previously defined by the user and displays that information to the user in a single screen, from which the user may select a transaction. Thus, the system allows the user to execute a financial transaction in fewer steps.

Representative claim 1 reads as follows:

An electronic financial transaction system for executing financial transactions, the transactions being characterized by a transaction type and a plurality of transaction parameters, the system comprising:

- a central controller;
- a communications network;
- a terminal device selectively connectable to the central controller through the communications network, the terminal device comprising:
 - a processor;
 - a display connected to the processor;

an input mechanism for providing input to the processor;
the system further comprising means for storing user defined transaction information, the transaction information comprising at least one of user defined transactions and user defined transaction parameters;
the processor causing the display to display on a single screen stored transaction information; the input mechanism enabling a user to use the displayed transaction information to execute a financial transaction or to enter selections to specify one or more transaction parameters.

'055 patent, col. 20, ll. 24-46. Claims 2, 9, 15 and 25 recite the system of claim 1, with additional limitations.

The accused system, the 1-click system, enables customers to purchase goods online from Amazon.com. The system allows customers who have previously stored information, including credit card numbers and shipping addresses, to place an order without having to reenter the stored information. Amazon stores each order placed using the 1-click system for ninety minutes, during which time the order can be modified or cancelled. At the end of ninety minutes, the orders remaining in the system are finalized; once the orders have been finalized and the goods have been shipped, Amazon requests funds from the user's credit card.

The district court, having construed the claim terms, found that the 1-click system did not meet the following claim limitations: "electronic financial transaction," "stored transaction information," and "single screen." The district court also found that claims 1, 2, 9 and 15 were anticipated, and thus invalid under 35 U.S.C. §102, as each limitation of the claims was disclosed by U.S. Patent No. 5,389,773 ("the Coutts patent"). Further, the district court found that claim 25 was indefinite, and thus invalid under 35 U.S.C. §112, as it claimed both a system and a method for using that system. Finding the

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case to be "exceptional," the district court awarded attorney fees and costs under 35 U.S.C. §285. On June 28, 2005, the district court set attorney fees and costs in the sum of \$1,674,645.82, plus interest. See *IPXL Holdings, L.L.C. v. Amazon.com, Inc.*, No. 04-CV-70 (E.D. Va. June 28, 2005).

On appeal, IPXL argues that the district court erred in several respects with regard to claim construction and that its judgment of noninfringement is therefore incorrect. IPXL also challenges the district court's determination that the Coutts patent anticipated claims 1, 2, 9 and 15 of the '055 patent, arguing that the Coutts patent does not disclose three aspects of the "single screen" limitation: a single screen, on which a stored transaction is displayed, and from which a user may select transaction parameters. IPXL further argues that claim 25 does not contain a method limitation within an apparatus claim and that the claim is therefore not indefinite. IPXL also challenges the award of attorney fees on the grounds that Amazon's motion for attorney fees was untimely under Fed. R. Civ. P. 54, as it was made more than fourteen days after entry of judgment. IPXL also argues that attorney fees were not warranted, as there was no showing of subjective bad faith such that the case cannot be found to be "exceptional."

Amazon argues that there was no error in the district court's claim construction and that both the decisions on noninfringement and invalidity are correct. Amazon also argues that its motion for attorney fees was timely and that, in any case, it was within the district court's discretion to allow the motion. Finally, Amazon argues that the case was "exceptional" and that the district court properly exercised its discretion to award attorney fees.

We hold that the district court correctly found that claims 1, 2, 9 and 15 are anticipated by the Coutts patent and that claim 25 is indefinite. Because the claims in suit are invalid, we need not visit the question of whether the district court erred in determining that the claims were not infringed. In addition, we hold that the correct way to perfect a claim to attorney fees under 35 U.S.C. §285 is through compliance with Fed. R. Civ. P. 54. Because Amazon did not file a timely request for attorney fees under that rule, the district court erred in granting attorney fees to Amazon, and we reverse the order granting attorney fees. Because the award of fees was improper, we need not address IPXL's contention that the case was not "exceptional" under 35 U.S.C. §285.

II

Claim construction is a question of law that this court reviews *de novo*. *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1456 [46 USPQ2d 1169] (Fed. Cir. 1998) (en banc). Similarly, indefiniteness is a question of law. *Atmel Corp. v. Info. Storage Devices*, 198 F.3d 1374, 1378 [53 USPQ2d 1225] (Fed. Cir. 1999). Anticipation is a question of fact. *Med. Instrumentation & Diagnostics Corp. v. Elekta AB*, 344 F.3d 1205, 1220 [68 USPQ2d 1263] (Fed. Cir. 2003).

Summary judgment is appropriate when no genuine issue of material fact exists and the moving party is entitled to judgment as a matter of law. Fed. R. Civ. P. 56(c). "In determining whether there is a genuine issue of material fact, the evidence must be viewed in the light most favorable to the party opposing the motion, with doubts resolved in favor of the opponent." *Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus.*, 145 F.3d 1303, 1307 [46 USPQ2d 1752] (Fed. Cir. 1998). When a district court grants summary judgment, we review *de novo* both whether there are disputed material facts and whether the prevailing party is entitled to judgment as a matter of law. *SunTiger, Inc. v. Scientific Research Funding Group*, 189 F.3d 1327, 1333 [51 USPQ2d 1811] (Fed. Cir. 1999).

In reviewing a motion for attorney fees under 35 U.S.C. §285, we review factual findings, such as whether a case is exceptional, for clear error. *Cybor Corp.*, 138 F.3d at 1460. We review *de novo* whether the district court applied the proper legal standard to the case. *Sulzer Textil A.G. v. Picanol N.V.*, 358 F.3d 1356, 1363 [69 USPQ2d 1961] (Fed. Cir. 2004). We then review the court's decision whether or not to award attorney fees under an abuse of discretion standard. *Id.*

III

Anticipation by the Coutts patent

A claim is anticipated under 35 U.S.C. §102 "if each and every limitation is found either expressly or inherently in a single prior

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art reference." *Bristol-Myers Squibb Co. v. Ben Venue Labs, Inc.*, 246 F.3d 1368, 1343 [58 USPQ2d 1508] (Fed. Cir. 2001). Under 35 U.S.C. §282, patents are presumed to be valid. However, a patent may be found to be anticipated on the basis of a reference that had properly been before the patent examiner in the United States Patent and Trademark Office ("PTO") at the time of issuance. See *Prima Tek II, L.L.C. v. Polypap, S.A.R.L.*, 412 F.3d 1284, 1287 [75 USPQ2d 1219] (Fed. Cir. 2005). The patent examiner in the instant case had initially rejected the '055 patent in light of the Coutts patent and the Anderson reference, which is not at issue here. *Summary Judgment*, 333 F.Supp.2d at 535. However, the patentee argued that the Coutts patent did not disclose "displaying transaction information on a single screen," and the examiner allowed the '055 patent. *Id.* at 536. At summary judgment, however, the district court held that there could be no genuine dispute that the Coutts patent disclosed each limitation of claims 1, 2, 9 and 15 of the '055 patent and thus held that these claims were anticipated and invalid. *Id.* at 536-43. On appeal, IPXL only challenges the district court's findings in regard to the "single screen" limitation.

The Coutts patent relates to a self-service system, such as an ATM, that uses predictive technology to increase the speed of operation of the system. After the user enters an identification card, the system predicts the user's desired transaction based upon "a stored record in the system, representing previous transactions by that user," and displays that information in order "to simplify the decisions and selections required to be made by the user." Coutts patent, abstract.

IPXL argues that the Coutts patent does not disclose the "single screen" limitation of the '055 patent, namely, "display[ing] on a single screen stored transaction information; the input mechanism enabling a user to use the displayed transaction information to execute a financial transaction or to enter selections to specify one or more transaction parameters." '055 patent, col. 20, ll. 41-46. IPXL argues that in the Coutts patent, transaction parameters are selected over multiple screens, not in a single screen. Further, IPXL argues that the screen does not display "stored transaction information." Finally, IPXL argues that the input mechanism does not allow a user to use the displayed information "to specify one or more transaction parameters."

The district court construed the single screen limitation to require "[t]he presentation of stored transaction information to a user on one screen, without the user having to first encounter any preliminary screens that would require the user to select a transaction type or a transaction parameter." *Summary Judgment*, 333 F.Supp.2d at 538-39. IPXL disputes the district court's

construction of the term "stored transaction information," as discussed *infra*, such that it argues that the district court improperly construed what must be displayed on the "single screen." However, IPXL does not dispute the underlying construction of the one screen part of the single screen limitation construction quoted above.

The district court construed the term "stored transaction information" to require a user-defined transaction, characterized by a transaction type and a plurality of user-defined transaction parameters, plus an additional user-defined transaction parameter. *Id.* at 519, 525-26, 538-39. Thus, under the district court's construction, "stored transaction information" requires a user-defined transaction type and three user-defined transaction parameters.

The district court further construed the term "transaction type" to mean "[a] particular kind, class, or group of electronic transfer[s] of funds or a particular kind, class, or group of electronic inquir[ies] as to funds. Examples of transaction types include withdrawals, deposits, transfers, payments, and balance inquiries." *Id.* at 524. The district court construed the term "transaction parameter" to mean "[a] property whose value determines the characteristics of (1) an electronic transfer of funds, or (2) an electronic inquiry as to funds. Examples of transaction parameters include the identification of the specific account, and the specific dollar amount." *Id.* at 524-25.

IPXL argues that the terms "transaction type" and "transaction parameter" were impermissibly limited to electronic transfer of funds or electronic inquiries as to funds. However, it does not contest the essential claim construction, *i.e.* that transaction type refers to the kind of transaction that takes place, whereas transaction parameter refers to a property whose value determines the characteristics of a transaction.

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[1] IPXL also argues before this court that "stored transaction information" requires only a user-defined transaction type and a single user-defined transaction parameter, not three user-defined transaction parameters. However, under either construction of the term "stored transaction information," the Coutts patent anticipates claims 1, 2, 9 and 15 of the '055 patent.

As noted by the district court, the Coutts patent teaches that "the processor means 32 causes a particular menu to be displayed on the lead-through display screen 18 following initiation of a transaction by a user and following a prediction that particular services are likely to be requested by the user." Coutts patent, col. 3, ll. 40-43. The menu displayed may be, "[f]or example, a simplified menu ... consisting of only four questions, such as: 'Do you require \$20?', 'Do you require \$30?', 'Do you require a mini-statement?', and 'Do you require some other transaction?'." *Id.* col. 3, ll. 45-49. Thus, the Coutts patent discloses a screen displaying stored transaction information.

IPXL argues, however, that the patent requires navigating through the "lead through display" in order to execute the transaction and that such a "lead through display" requires a "series of screens and instructions." Pet. Br. at 46. Thus, IPXL argues that the screen displayed is not the "single screen" of the '055 patent. However, nothing in the Coutts patent indicates that the phrase "lead through display" refers to a series of screens. Rather, as the district court noted, the "lead through display" refers to a physical component, not the image presented. *Summary Judgment*, 333 F.Supp.2d at 539-40. The Coutts patent refers to the same component, element 18, by four different names: lead-through display screen, lead-through display, display screen, and screen. Figure 2, a schematic diagram of an ATM, groups element 18 – a "lead-through display" – with two other physical objects, an input means and a card reader. Thus, the patent notes that a "visual display" is made "on the screen 18." Coutts patent, col. 5, ll. 7-12. All together, this indicates that element 18, the "lead-through display" is a physical object upon which information is displayed.

In addition, the description of the patented Coutts invention indicates that a single screen display was contemplated. *Id.* col. 4, ll. 44-53. After a user identification process, *i.e.* inserting an identification card and entering a personal identification number, the display screen shows possible transactions to be chosen. This, the patent notes, is "the commencement of the interaction process." *Id.* col. 4, ll. 51-52. If one of the displayed transactions is desired, the user must simply indicate the desired transaction through the input means, and the transaction is completed. *Id.* col. 4, ll. 49-53. Thus, no transaction information need be entered before the single screen displays a plurality of predicted transactions, which are based on previously entered transaction information.

IPXL further argues that the Coutts patent does not display the stored transaction information.

However, the Coutts patent clearly discloses the display of multiple transaction types and multiple transaction parameters. For example, the summary of the invention discloses the types of services which may be performed using a single terminal, including withdrawal (transaction type 1) of different cash amounts (transaction parameter 1), account balance inquiry (type 2) via printing (parameter 2) or display (parameter 3), or transaction inquiry (type 3) via printing of a mini-statement (parameter 4) or a full statement (parameter 5). *Id.* col. 1, l. 65 – col. 2, l. 7. Similarly, the aforementioned example of a simplified menu displays two transaction types, withdrawal and transaction inquiry, and at least three transaction parameters, an amount of \$20, an amount of \$30, and the printing of a mini-statement. *Id.* col. 3, ll. 45-49. In addition, it is clear that these transaction parameters and transaction types are “user-defined” and “stored” as the transaction options presented are predicted based upon “previous transactions by that user” that are in a “stored record.” *Id.* abstract; see also *id.* col. 6, ll. 36-38, 41-43.

Finally, IPXL argues that the Coutts patent does not enable the user to “enter selections to specify one or more transaction parameters.” However, as noted above, the Coutts patent allows a user to select one of a variety of transaction options. As an example, the patent notes that a simplified menu on a single screen will offer choices “such as: ‘Do you require \$20?’, ‘Do you require \$30?’, ‘Do you require a mini-statement?’, and ‘Do you require

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some other transaction?’.” *Id.* col. 3, ll. 45-49. If one of the options is that which the user prefers, he may input appropriately, and the transaction is completed. IPXL argues that this constitutes “selecting one transaction over another” and that it does not constitute “enter[ing] selections to specify one or more transaction parameters.” Pet. Br. at 49. However, choosing between withdrawing \$20 and \$30 involves specifying one of two transaction parameters, i.e. the amount of the transaction. Thus, the Coutts patent discloses enabling a user to “enter selections to specify one or more transaction parameters.”

As the Coutts patent discloses the single screen limitation recited above, and IPXL does not contest that it discloses the other limitations of claims 1, 2, 9, and 15 of the ‘055 patent, we affirm the district court’s grant of summary judgment to Amazon on the ground that the Coutts patent anticipates claims 1, 2, 9 and 15 of the ‘055 patent.

Indefiniteness of Claim 25

The district court found that claim 25 is indefinite under 35 U.S.C. §112, as it attempts to claim both a system and a method for using that system. Section 112, paragraph 2, requires that the claims of a patent “particularly point[] out and distinctly claim[] the subject matter which the applicant regards as his invention.” 35 U.S.C. §112 (2000). A claim is considered indefinite if it does not reasonably apprise those skilled in the art of its scope. *Amgen, Inc. v. Chugai Pharm. Co.*, 927 F.2d 1200, 1217 [18 USPQ2d 1016] (Fed. Cir. 1991).

[2] Whether a single claim covering both an apparatus and a method of use of that apparatus is invalid is an issue of first impression in this court. The Board of Patent Appeals and Interferences (“Board”) of the PTO, however, has made it clear that reciting both an apparatus and a method of using that apparatus renders a claim indefinite under section 112, paragraph 2. *Ex parte Lyell*, 17 USPQ2d 1548 (BPAI 1990). As the Board noted in *Lyell*, “the statutory class of invention is important in determining patentability and infringement.” *Id.* at 1550 (citing *In re Kuehl*, 475 F.2d 658, 665 [177 USPQ 250] (CCPA 1973); *Rubber Co. v. Goodyear*, 76 U.S. 788, 796 (1870)). The Board correctly surmised that, as a result of the combination of two separate statutory classes of invention, a manufacturer or seller of the claimed apparatus would not know from the claim whether it might also be liable for contributory infringement because a buyer or user of the apparatus later performs the claimed method of using the apparatus. *Id.* Thus, such a claim “is not sufficiently precise to provide competitors with an accurate determination of the ‘metes and bounds’ of protection involved” and is “ambiguous and properly rejected” under section 112, paragraph 2. *Id.* at 1550-51. This rule is well recognized and has been incorporated into the PTO’s *Manual of Patent Examination Procedure*. §2173.05(p)(II) (1999) (“A single claim which claims both an apparatus and the method steps of using the apparatus is indefinite under 35 U.S.C. 112, second paragraph.”); see also Robert C. Faber, *Landis on Mechanics of Patent Claim Drafting* §60A (2001) (“Never mix claim types to different classes of invention in a single claim.”).

Claim 25 recites both the system of claim 2 and a method for using that system. The claim reads:

The system of claim 2 [including an input means] wherein the predicted transaction information comprises both a transaction type and transaction parameters associated with that transaction type, and the user uses the input means to either change the predicted transaction information or accept the displayed transaction type and transaction parameters.

'055 patent, col. 22, ll. 8-13 (emphasis added).

Thus, it is unclear whether infringement of claim 25 occurs when one creates a system that allows the user to change the predicted transaction information or accept the displayed transaction, or whether infringement occurs when the user actually uses the input means to change transaction information or uses the input means to accept a displayed transaction. Because claim 25 recites both a system and the method for using that system, it does not apprise a person of ordinary skill in the art of its scope, and it is invalid under section 112, paragraph 2.

IV

Judgment in favor of Amazon was entered on August 27, 2004. On September 13, 2004, Amazon filed a motion for attorney fees seeking

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relief under three different statutory provisions: 28 U.S.C. §1927, Fed. R. Civ. P. 11, and 35 U.S.C. §285. IPXL responded with a motion to strike, arguing that any motion for attorney fees must comply with Fed. R. Civ. P. 54(d)(2)(B), which provides that "[u]nless otherwise provided by statute or order of the court, the motion must be filed no later than 14 days after entry of judgment." Because Amazon's motion, filed seventeen days after entry of judgment, was untimely, IPXL contended that the motion must be struck.

Amazon responded to the motion to strike, arguing that the 14-day limit was inapplicable because, in Amazon's view, its motion was one for sanctions under Fed. R. Civ. P. 54(d)(2)(E), which provides that the 14-day rule does not apply to "claims for fees and expenses as sanctions for violations of these rules or under 28 U.S.C. §1927." Amazon made no attempt to claim excuse for breach of the 14-day rule under Fed. R. Civ. P. 6(b), which permits enlargement of the 14-day time period of Rule 54, but only subject to the strictures of Rule 6(b). As Amazon made no attempt to seek enlargement of the 14-day time period pursuant to Rule 6, it is not surprising that Amazon pitched its argument to district court under Rule 54(d)(2)(E).

The district court decided the attorney fee issue on the written record provided by the parties. First, the district court rejected Amazon's plea for relief based on Rule 11. Transcript of Motions Hearing at 4, *IPXL Holdings, L.L.C. v. Amazon.com, Inc.*, No. 04-CV-70 (E.D. Va. Sept. 24, 2004). Next, the district court rejected 28 U.S.C. §1927 as a ground for attorney fees in this case. *Id.* Amazon does not contest that aspect of the district court decision. Finally, the district court recognized that Amazon's motion was out of time under Rule 54. Noting that no showing of good cause had been made under Rule 6 for enlargement of the 14-day time period, the district court commented that "there is some merit" to IPXL's motion to strike. *Id.* at 4-5.

Nonetheless, the district court held that a claim to attorney fees under section 285 "is not barred by the [14-day] time limit" and that even if attorney fees under that provision were subject to Rule 54, the court would "exercise its discretion and allow Amazon leave to file out of time." *Id.* at 5. Consequently, the district court denied IPXL's motion to strike and, finding the case exceptional, granted Amazon's motion for attorney fees under section 285.

IPXL appeals the award of attorney fees, arguing that the proper way to perfect a claim to attorney fees under section 285 is through compliance with Rule 54. IPXL disputes the district court's holding that section 285 itself grants authority to a district court to award attorney fees thereunder, even where Rule 54 is not satisfied. Consequently, IPXL asserts that the district court lacked authority to consider the motion for attorney fees. With no proper motion before it, the district court had no issue upon which it could exercise its discretion.

Amazon counters by placing its reliance again on Rule 54(d)(2)(E). Because the district court determined that this was not a "close case" when deciding that the case was exceptional, Amazon argues that the district court in essence held that the case was legally frivolous such as to warrant

sanctions for violation of Rule 11. Thus, according to Amazon, the attorney fee award was a sanction for violation of one of "these rules" in accordance with Rule 54(d)(2)(E). We reject this argument. The district court did not hold that the case was "frivolous" under Rule 11. Rather, it awarded attorney fees under 35 U.S.C. §285.

Amazon's second ground to support the award of attorney fees is that the district court properly exercised its discretion to enlarge the 14-day filing time under Rule 6(b). Even assuming the district court was referring to Rule 6(b) when it allowed Amazon to file out of time, the record is clear that Amazon never made a motion under Rule 6(b)(2), seeking enlargement of time after the 14-day time period had run, based on "excusable neglect," which is the standard the district court must apply in exercising discretion to enlarge time under that subsection of Rule 6.

[3] We think it is clear that on this record there is no basis for an award of attorney fees under Rule 11 or 28 U.S.C. §1927. Assuming this is an exceptional case, an issue we do not reach, Amazon's claim to fees under section 285 is viable. However, we hold that any claim to attorney fees must be processed in compliance with Rule 54(d)(2)(B). No provision in section 285 exempts requests for attorney fees thereunder from compliance with Rule 54(d)(2)(B).

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The district court's holding that section 285 itself can support an award of attorney fees without regard to when the relief is requested is legally incorrect. Further, in this case, the 14-day rule of Rule 54 was breached, and Amazon took no steps under Rule 6(b)(2) that could have afforded the district court a basis upon which to exercise discretion to enlarge the 14-day time period. Consequently, the district court abused its discretion in enlarging the applicable time and in denying IPXL's motion to strike. The district court was here obligated to grant IPXL's motion, and the award of attorney fees and costs to Amazon is therefore reversed.

COSTS

No costs.

AFFIRMED IN PART AND REVERSED IN PART

- End of Case -

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Ex parte Lyell

U.S. Patent and Trademark Office, Board of Patent Appeals and Interferences

No. 89-0461

Decided August 16, 1990

Headnotes

PATENTS

[1] Patentability/Validity - Specification - Claim adequacy (► 115.1109)

Claim which combines description of automatic transmission workstand with description of method for using it violates second paragraph of 35 USC 112, since purpose of that paragraph is to require patentee to provide others with notice of boundaries of protection provided by patent, since manufacturer or seller, at time of making or selling workstand of structure set forth in claim, would have no indication whether it might later be sued for contributory infringement if workstand is used in accordance with claimed method, and since claim is thus not sufficiently precise that possibility of infringement may be determined with reasonable degree of certainty.

[2] Patentability/Validity - Subject matter (► 115.05)

Patentability/Validity - Specification - Claim adequacy (► 115.1109)

Claim which is intended to embrace both product or machine and process is precluded by language of 35 USC 101, which sets forth statutory classes of invention in alternative only, and is also invalid under 35 USC 112, second paragraph, since claim which purports to be both machine and process is ambiguous and therefore does not particularly point out and distinctly claim subject matter of invention.

[3] Patentability/Validity - Specification - Claim adequacy (► 115.1109)

Patent construction - Claims - Process (► 125.1309)

Single patent may include claims directed to more than one statutory class of invention, but no basis exists for permitting combination of two separate and distinct classes of invention in single claim; this rule is not violated by product-by-process claims, which use process limitations to define product, since such claims are considered to be directed toward product only, and thus encompass only single statutory class of invention, even though they contain process language.

Case History and Disposition

Appeal from final rejection of all claims remaining in application for patent (Robert C. Watson, primary examiner).

Patent application of David L. Lyell, serial no. 845,505, filed March 28, 1986 (automatic transmission tool). From final rejection of all claims remaining in application, applicant appeals. Affirmed.

Attorneys

Jerry C. Lyell, Arlington, Va., for appellant.

Judge

Before Serota¹, chairman, Calvert,¹ vice chairman, McCandlish, Cohen, and Frankfort, examiners-in-

chief.

¹ Serota and Calvert were added post hearing in view of the legal issues raised in this appeal. Compare *In re Bose Corp.*, 772 F.2d 866, 227 USPQ 1 (Fed.Cir. 1985) and see *Ex parte Kumagai*, 9 USPQ2d 1642 (BPAI 1988).

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Opinion Text

Opinion By:

Frankfort, examiner-in-chief.

This is a decision on appeal from the final rejection of claims 2, 4, 7, 8 and 10 through 12, which are the only claims remaining in this application.²

² While both the examiner's final rejection (paper No. 4) and the appellant's Notice of Appeal (paper No. 5) make reference to claim 1, we note that these references are in error since claim 1 was cancelled by the amendment filed May 8, 1987 (paper No. 3). Thus, only claims 2, 4, 7, 8 and 10 through 12 remain for our consideration on appeal.

Appellant's disclosure relates to a transmission repair tool in the form of a workstand and to the method of using same in repairing automatic transmissions. The subject matter on appeal is represented by independent claim 2, which reads as follows:

2. An automatic transmission tool in the form of a workstand and method for using same comprising:
 - a support means,
and [sic] internally splined sleeve affixed upright to said support means,
a threaded adjustment bolt threadably engaged through a hole in the bottom of said support means and projecting upward through said support frame into said sleeve,
and further comprising the steps of
 1. positioning the output end of an automatic transmission onto said upright sleeve,
 2. removing the internal components of said automatic transmission from the casing of said transmission,
 3. repairing and replacing said internal components back into said casing, and
 4. adjusting said internal components for fit and interference by means of adjusting said upwardly projecting adjustment bolt.

The references of record relied upon by the examiner in the final rejection are:

Morawski et al. (Morawski) 3,701,539 Oct. 31, 1972

Hayden, *Hayden-Trans-Tool Catalog*, "Transmission Tools & Equipment," item No. T-1060-A, p. 17 1986-87.

Claims 2, 4, 7, 8 and 10 through 12 stand rejected under 35 USC 112, second paragraph, as being indefinite. According to the examiner, the claims are ambiguously constructed and indeterminate in scope because they purport to claim both an apparatus and method of using the apparatus in a single claim.

Claims 2, 4, 7, 8 and 10 through 12 stand further rejected under 35 USC 102(b) as being anticipated by Morawski. As indicated

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on page 2 of the answer, it is the examiner's position that

Insofar as the claim [sic, claim 2] can be understood it is being treated as an apparatus

claim. The various method steps are accordingly, non-substantive having no patentable significance. In Morawski et al (14) is a support means, (10, 46) is a sleeve (48) is a threaded adjustment bolt. Sleeve (10) has a seating surface and (46) contains an internal spline. The intended use of the device has not been accorded any patentable weight. Hence, no patentable significance has been accorded to the transmission casing or shaft recitations.

Claims 2, 4, 7, 8 and 10 through 12 were also finally rejected under 35 USC 102(a) as being anticipated by item No. T-1060-A of the Hayden-Trans-Tool Catalog. However, we note that this rejection has now been *withdrawn* by the examiner (see paper No. 11) in view of the affidavits under 37 CFR 1.131 which accompanied the reply brief of June 10, 1988. Accordingly, only the rejections of the appealed claims under 35 USC 112, second paragraph and 35 USC 102(b) remain for our consideration on appeal.

In traversing the §112 rejection, appellant contends that the apparatus and method involved in the present application are "inextricably related" (brief, page 4) and that the tool is not useful in a practical and patent sense unless the method is disclosed to the user. Appellant urges that we "find that apparatus and method elements of Appellant's claims are sufficiently distinct to enable one skilled in the art of making or using such tools to practice the invention" (emphasis in original), and to further find that "the apparatus and method claims are proper within one patent" (brief, page 5).

With respect to the Morawski reference applied by the examiner in rejecting the appealed claims under 35 USC 102(b), it is the appellant's position that "[t]he critical feature of the Lyell device, that of holding the output shaft and coaxial transmission components in a spaced relationship with the outer casing, is absent in the Morawski device" (brief, page 6). We refer to pages 4 through 8 of the brief for the full statement of the appellant's position regarding the issues before us on appeal.

At the outset, we note that the appellant has chosen not to separately argue with any reasonable specificity the patentability of dependent claims 4, 7, 8 and 10 through 12. Accordingly, these claims will stand or fall with the rejection of independent claim 2. See *In re Nielson*, 816 F.2d 1567, 2 USPQ2d 1525 (Fed.Cir. 1987).

We treat first the rejection of the appealed claims under 35 USC 112, second paragraph. The second paragraph of 35 USC 112 requires a claim to particularly point out and distinctly claim the subject matter which the applicant regards as his invention. In discussing the requirements of the second paragraph of 35 USC 112, the Court of Customs and Patent Appeals in *In re Hammack*, 427 F.2d 1378, 166 USPQ 204 (CCPA 1970), stated at 166 USPQ 208 :

Its purpose is to provide those who would endeavor, in future enterprise, to approach the area circumscribed by the claims of a patent, with the adequate notice demanded by due process of law, so that they may more readily and accurately determine the boundaries of protection involved and evaluate the possibility of infringement and dominance.

In this same vein, we would note that the statutory class of invention is important in determining patentability and infringement. As indicated by the court in *In re Kuehl*, 475 F.2d 658, 665, 177 USPQ 250, 255 (CCPA 1973), "[E]ach statutory class of claims must be considered independently on its own merits." See also *Rubber Co. v. Goodyear*, 76 U.S. 788, 796, 19 L.Ed 566 (1870) (discussing patentability of different classes of invention), and *Merrill v. Yeomans*, 94 U.S. 568, 24 L.Ed. 235 (1877) (indefinite claim held to be to a process of treating oils rather than the product of the process).

[1] Appellant's independent claim 2, in combining two separate statutory classes of invention in a single claim, in our opinion, would raise serious questions for a manufacturer or seller of a tool like that claimed by appellant regarding infringement. Such a manufacturer or seller would have no indication at the time of making or selling a workstand of the structure set forth in appellant's claim 2 whether they might later be sued for contributory infringement because a buyer/user of the workstand later performs the appellant's claimed method of using the workstand. We therefore find that appellant's claim 2 is not sufficiently precise to provide competitors with an accurate determination of the "metes and bounds" of protection involved so that an evaluation of the possibility of infringement may be ascertained with a reasonable degree of certainty, as discussed by the court in *In re Hammack, supra*. Accordingly, for this reason alone we would sustain the examiner's rejection of appellant's independent claim 2 and of dependent

claims 4, 7, 8 and 10 through 12 under 35 USC 112, second paragraph.

[2] As we noted above, the second paragraph of 35 USC 112 requires a claim to particularly point out and distinctly claim the subject matter which the appellant regards as his invention. However, the "invention" referred to in the second paragraph of 35 USC 112 is also subject to the requirements of 35 USC 101. This section of the statute requires that in order to be patentable the invention must be a "new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof" (emphasis added). In the situation before us on appeal, it is clear that appellant's independent claim 2 is intended to embrace or overlap two different statutory classes of invention set forth in 35 USC 101. In our view, a claim of this type is precluded by the express language of 35 USC 101 which is drafted so as to set forth the statutory classes of invention in the alternative only. Further, we must agree with the examiner that a single claim which purports to be both a product or machine and a process is ambiguous and is properly rejected under 35 USC 112, second paragraph, for failing to particularly point out and distinctly claim the invention. While the examiner has only set forth the rejection of the appealed claims as being under 35 USC 112, second paragraph, we note that he has relied upon 35 USC 101 in supporting his position that appellant's claims on appeal are ambiguously drafted and indeterminate in scope. See page 3 of the examiner's answer. Thus, we consider that whether the appropriate statutory ground of rejection is 35 USC 101 and/or 35 USC 112, second paragraph, the appellant has been clearly apprised of the basis for the rejection and has had a fair opportunity to respond to the basic thrust of the rejection. Compare, *In re Kronig*, 539 F.2d 1300, 190 USPQ 425 (CCPA 1976) and *In re Rasmussen*, 650 F.2d 1212, 211 USPQ 323 (CCPA 1981).

[3] Turning to the appellant's arguments, we first note that the statement on page 5 of the brief concerning "making or using" the appellant's claimed invention would seem to be more appropriately directed at a rejection under 35 USC 112, first paragraph, based upon lack of enablement. However, no such rejection is before us on appeal. Next, we note that while it has long been settled that a single patent may include claims directed to more than one statutory class of invention (e.g., a claim to an apparatus and a separate claim to a method of using or producing the apparatus), we find no basis for permitting a combination of two separate and distinct statutory classes of invention in a single claim. Indeed, the cases cited by the appellant in his brief do not suggest otherwise, as evidenced by the quote (brief, page 5) chosen from *Expanded Metal Co. v. Bradford*, 214 U.S. 366, 385 (1909): "A process and an apparatus by which it is performed are distinct things."

Patents are authorized by statute and Congress has indicated that inventions may be patentable only if they fall within *one* of the statutory classes of subject matter specified in 35 USC 101, e.g., "process, machine, manufacture or composition of matter," see *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 483, 181 USPQ 673, 679 (1974). Historically, these categories of invention have been regarded as "four great and distinct classes of invention." *Ex parte Blythe*, 1885 C.D. 82, 86. The first statutory class, process, is defined in 35 USC 100(b) and refers to "arts", while the last three classes, machine, manufacture and composition of matter, refer to physical *things* or *products*. "An applicant who claims a product is not required to state whether it is a machine, manufacture, or composition of matter" and products may fall into alternative classes, e.g., a machine or manufacture. 1 Chisum, *Patents*, §1.02 (1989). However, the classes of machine, manufacture or composition of matter "all differ fundamentally in nature from a process." *Nestle-Le Mur Co. v. Eugene, Ltd.*, 55 F.2d 854, 858, 12 USPQ 335, 339 (6th Cir. 1932). We note that eminent legal writers, such as Robinson, have held similar views. Robinson's "Treatise on the Law of Patents" (1890), at section 511 (page 118); states:

... every claim must define the invention it includes in such a manner as to indicate the class of inventions to which it belongs. While the claim need not state in terms whether the invention claimed is an art [process], a machine, a manufacture, a composition of matter, a design, or an improvement, it must be apparent to which of these great classes the invention does pertain.

See also Deller, *Patent Claims*, Chap. VIII and Chap. IX (2d ed, 1971). As stated in Deller, §133:

A claim is single and is either for a process or product. If the claim were divisible, one part would be for a process and the other for a manufacture and it might be in danger of being held void for ambiguity. An applicant for a patent may separately claim a patentable process and a patentable product, but cannot properly cover them both in one claim. They are proper subjects of separate and distinct claims.

(*Merrill v. 1 Bann & Ard*, 55 and 94 US 568 and 24 L ed 235; *Goodyear v. Rubber Co.*, 2 Cliff 371 and 76 US 788 and 19 L ed 566; *Durand v. Schulze*, 61 F819).

The dichotomy between process and product classes of invention has also been recognized and noted in the following discussion in *Ex Parte Forsyth*, 151 USPQ 55, 56 (Bd. of Appeals 1965):

A claim such as those before us cannot be both method and apparatus. It must be clear from its wording that it is drawn to one or the other of these mutually exclusive statutory classes of invention. A method or process, as indicated above, is an act or a series of acts and from the standpoint of patentability must distinguish over the prior art in terms of steps, whereas a claim drawn to apparatus must distinguish in terms of structure. This is so elemental as not to require citation of authorities. The Patent Act of 1952 did not abolish the then existing different classes of invention. It reaffirmed the same by Section 101 of USC 35.

We however do recognize that certain types of claims which appear to be "hybrid" are permitted in U.S. patent practice. In particular, we refer to product-by-process claims. While this type of claim format may facially appear to cross the line between statutory classes of invention, we note that such is not the case. A product-by-process claim merely uses one statutory class of invention (i.e., process limitations) to define or fingerprint another statutory class (i.e., the product) which is not readily susceptible to definition solely by structure or physical characteristics. As the court indicated in *In re Thorpe*, 777 F.2d 695, 227 USPQ 964 (Fed.Cir. 1985) citing *In re Brown*, 459 F.2d 531, 173 USPQ 685, 688 (CCPA 1972) and *In re Pilkington*, 411 F.2d 1345, 162 USPQ 145 (CCPA 1969):

Product-by-process claims are not specifically discussed in the patent statute. The practice and governing law have developed in response to the need to enable an applicant to claim an otherwise patentable product that resists definition by other than the process by which it is made. For this reason, even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. (citations omitted)

The patentability of a product does not depend on its method of production. (citation omitted) If the product in a product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. (citations omitted).

Thus, we would distinguish appellant's claim 2 from a product-by-process claim because in a typical product-by-process claim the process referred to is the process of making a product, as opposed to the process of using a product or apparatus, as is set forth in appellant's claim 2 on appeal. We would further note that we consider appellant's claim 2 to be clearly distinguishable from product-by-process claims, since, as noted in the quotation above, such claims have long been considered to be solely "product" claims, and, in contrast to appellant's claim 2, would thus encompass only a single statutory class of invention set out in 35 USC 101.

When it comes to a final consideration of appellant's claim 2, we see no reason or legal basis in the patent law to make an exception to claim practice which has existed for over 100 years. In view of the long-standing practice of requiring a product and a process to be separately claimed, we believe that Congress should speak before the Patent and Trademark Office allows a claim which covers a combination of a product and a process.

In light of the foregoing, it is our conclusion that appellant's claim 2, which purports to be both an apparatus and a process in a single claim, is ambiguous and properly rejected under 35 USC 112, second paragraph. As we indicated earlier, dependent claims 4, 7, 8 and 10 through 12 fall with independent claim 2. See *In re Nielson*, *supra*.

With regard to the examiner's rejection of appealed claims 2, 4, 7, 8 and 10 through 12 under 35 USC 102(b) as anticipated by Morawski, it is our view that since the appealed claims are indefinite and indeterminate in scope for the reasons stated *supra*, it is not possible to apply the prior art to these claims in deciding patentability without disregarding portions of the express wording of the claims and thus resorting to speculation and conjecture as to the particular invention defined therein. We therefore will not sustain the examiner's rejection of the appealed claims under 35 USC 102(b). See *In re Wilson*, 424 F.2d 1382, 165 USPQ 494 (CCPA 1970) and *In re Steele*, 305 F.2d 859, 134 USPQ 292 (CCPA 1962).

In summary, the examiner's decision rejecting the appealed claims under 35 USC 112, second paragraph, is *affirmed*, while the rejection of these claims under 35 USC 102(b) is *reversed*.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR 1.136(a). See the

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final rule notice, 54 F.R. 29548 (July 13, 1989), 1105 O.G. 5 (August 1, 1989).

AFFIRMED

- End of Case -

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second said block period following said first block period, and means for instructing the machine to store the calculated first tone waveform samples in a memory, and sequentially read out at regular sampling intervals in said second block period said first tone waveform samples stored in the memory;

means for instructing the machine to detect a portion of the processing capability of said arithmetic processing section which is not currently occupied by the process of calculating said first tone waveform samples, as available processing capability for generation of a tone waveform based on said second performance information;

means for instructing the machine to calculate second tone waveform samples based on said second performance information in advance of predetermined generation timing thereof, using said detected available processing capability, said means for instructing the machine to calculate second tone waveform samples including means for instructing the machine to store in a memory the calculated second tone waveform samples; and

means for instructing the machine to generate tone waveform samples corresponding to the real-time performance and automatic performance by, at regular sampling intervals, reading out from the memory said first and second tone waveform samples corresponding to each same said block period.

15. A computer system for generating a tone waveform based on automatic performance information, said computer system comprising:

a memory device that stores a plurality of programs; and a processor device that executes a waveform generating process including a waveform calculating process for calculating tone waveform samples based on a predetermined one of said programs, and one or more other processes based on other of said programs in a parallel manner on a time-divisional basis,

wherein said processor device includes:

means for detecting an available time portion in which said processor device is not currently occupied by the other process, as available processing capability for the waveform calculating process;

means for calculating a plurality of tone waveform samples based on the performance information in advance of predetermined generation timing thereof by executing the waveform calculating process using said available processing capability detected by said means for detecting;

means for storing the calculated tone waveform samples in a memory; and

means for generating a tone waveform by reading out the tone waveform samples from the memory.

16. A computer system for generating a tone waveform based on performance information, said computer system comprising:

a memory device that stores a plurality of programs; and a processor device that executes a waveform generating process including a waveform calculating process for calculating tone waveform samples based on a predetermined one of said programs and one or more other processes based on other of said programs in a parallel manner on a time-divisional basis,

wherein said processor device includes:

means for detecting an amount of calculation time necessary for said other process, when the waveform calculating process is to be executed; and

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means for calculating tone waveform samples by selectively executing the waveform calculating process that involves a variable calculation amount which depends on said amount of calculation necessary for said other process detected by said means for detecting.

17. A computer system for generating tone waveforms corresponding to first performance information based on a real-time performance and second performance information based on an automatic performance, which executes a waveform calculating process for calculating tone waveform samples on the basis of said first and second performance information, respectively, by use of a common arithmetic processing section, said computer system comprising:

means for calculating a predetermined number of first tone waveform samples for each predetermined period on the basis of said first performance information supplied in response to a real-time performance;

means for detecting a portion of processing capability of said arithmetic processing section which is not currently occupied by a process for calculating said first tone waveform samples, as available processing capability for generation of a tone waveform based on said second performance information;

means for calculating second tone waveform samples based on said second performance information in advance of predetermined generation timing thereof, using said available processing capability detected by said means for detecting;

means for storing in a memory said first and second tone waveform samples calculated by said means for calculating; and

means for generating tone waveforms corresponding to the real-time performance and automatic performance by synchronously reading said first and second tone waveform samples from the memory.

18. A computer system for generating tone waveforms corresponding to first performance information supplied in response to a real-time performance and second performance information supplied in response to an automatic performance, which executes a waveform calculating process for calculating tone waveform samples on the basis of said first and second performance information, respectively, by use of a common arithmetic processing section, said computer system comprising:

means for calculating a predetermined number of first tone waveform samples for each predetermined block period on the basis of said first performance information supplied in response to a real-time performance, said means for calculating, at optional time within first said block period, calculating said predetermined number of first tone waveform samples to be generated within second said block period following said first block period and storing the calculated first tone waveform samples in a memory, said first tone waveform samples stored in the memory being sequentially read out at regular sampling intervals in said second block period;

means for detecting a portion of processing capability of said arithmetic processing section which is not currently occupied by a process for calculating said first tone waveform samples, as available processing capability for generation of a tone waveform based on said second performance information;

means for calculating second tone waveform samples based on said second performance information in

advance of predetermined generation timing thereof, using said available processing capability detected by said means for detecting, said means for calculating second tone waveform samples also storing in a memory the calculated second tone waveform samples; and

means for generating tone waveform samples corresponding to the real-time performance and automatic performance by, at regular sampling intervals, reading out from the memory said first and second tone waveform samples corresponding to each same said block period.

* * * * *

At step S31, a determination is made as to whether there is time available for the "advanced" data writing, i.e., whether the CPU 10 is not busy with any other software concurrently run with the reproduction processing software. If there is time available for the data writing, the writing block pointer WP is incremented by one at step S32 so as to point to a block in which data are to be written after this, and performance data corresponding to one block are read out for reproduction at step S33. Then, waveform data for one block are calculated on the basis of the read-out performance data at step S34, and the calculated waveform data are written into a block pointed to by the writing block pointer WP. In this case, the waveform data calculation is executed with high precision for all the tone generating channels because sufficient time can be spent on the calculation.

Thereafter, the reproduction processing goes to step S35 to make a determination as to whether the block for which the data writing has been executed this time is the last block, or to step S36 to make a determination as to whether the sample buffer is now full of unread waveform data. If the block is the last block as determined at step S35, the write-enable flag WF is reset to "0" at step S37 because it is no longer necessary to write waveform data, and then the reproduction processing is brought to an end. The determination as to whether the sample buffer is now full of unread waveform data is made by checking whether the writing block pointer WP has catch up with the reading block pointer RP after making a round through the ring buffer in advance of the reading block pointer RP ($WP=RP-1$). Writing new data when the sample buffer is full of unread data will result in overwriting unread data, and thus the reproduction processing is brought to an end after the affirmative determination at step S36. If the sample buffer is not full of unread data, i.e., has any other block available for writing data, as determined at step S36, the reproduction processing loops from step S36 back to step S31. If it is determined at step S31 that there is still time left, then the data writing is performed for a next block.

In the above-described reproduction processing, the reading block pointer RP is constructed as a so-called "free-running" counter because the sample buffer may be used for real-time performance data input when an automatic performance is not executed and the pointer RP is incremented whenever the reproduction processing steps through steps S20 to S24. Therefore, when waveform data are to be written into the sample buffer prior to a start of an automatic performance (i.e., before the read-enable flag RF is set to "1"), it is determined how earlier than the start of an automatic performance the writing of waveform data should be initiated (namely, a determination is made of a specific number of counts of the calculation triggering clock pulses BC by which the writing of waveform data should precede the automatic performance start), and then the writing block pointer WP is set to a value equivalent to a sum of a current value of the writing block pointer WP and the number of counts by which the data writing should precede the data reading. After this, the write-enable flag is set to "1" so that leading waveform data start being written into the block pointed to by the writing block pointer WP.

Once the specific number of the calculation triggering clock pulses B are generated and hence the reading block pointer RP reaches the block where the waveform data writing was initiated, the automatic performance is started (i.e., the read-enable flag RF is set to "1") and the waveform data are read out properly from the beginning. By virtue of the arrangement that the data writing is executed (i.e., the write-enable flag WF is set to "1") prior to the start of the

automatic performance (i.e., the read-enable flag RF is set to "1"), the function of executing the data writing (calculation) in advance of the data reading can be utilized effectively from the starting point of the automatic performance.

In summary, according to the above-described embodiment, there are provided a plurality of storage regions (blocks) for storing waveform data (waveform sample values), waveform data to be supplied to the D/A converter 19 are generated collectively in advance during a period when the amount of calculation necessary for another software processing executed in parallel with the reproduction processing software is small (i.e., when the CPU 10 is not busy with the other software processing), and the thus-generated waveform data are stored in the blocks of the sample buffer. Thus, when the calculation amount of the other software processing increases temporarily, waveform data generating operations to be performed at that time can be skipped without any trouble since waveform data to be supplied to the reproduction section 18 at that timing have been generated and saved previously. This prevents operational delays in the other software processing. Because generation and supply to the reproduction section 18 of waveform data are conducted on a block-by-block basis, a determination as to whether there is time available is greatly facilitated and a plurality of waveform data can be generated collectively, which provide increased operating efficiency.

Each of the blocks of the sample buffer has been described as storing 128 waveform samples, but, where the system is designed to no accept real-time performance data input, each of the blocks may be designed to store a greater number of samples, e.g., 1,024 or 4,096 samples, so as to permit the CPU 10 to operate more efficiently. However, where the system accepts real-time performance data input, designing each of the blocks to store such a greater number of samples is not preferable in that intervals between the calculation triggering clock pulses BC become longer and hence greater time lags will occur from the real-time performance data input to actual sounding of a tone corresponding thereto.

The present invention arranged in the above-described manner achieves the following benefits.

According to the present invention, a detection is made of calculating capability of the CPU 10 or arithmetic processing section that is unoccupied by other software processing and hence available for the reproduction processing and a specific number of tone waveform sample values corresponding to the unoccupied or available calculating capability are generated prior to predetermined readout timing of the sample values. Thus, when a plurality of applications are run concurrently on a multitask basis, it is allowed to calculate waveform data collectively for memory storage utilizing the unoccupied or available calculating capability, which permits the CPU or arithmetic processing section to operate with greatly increased efficiency. Because it is just sufficient that the previously stored waveform data be read out to be transmitted to the reproduction section 18 when the arithmetic processing section is busy with another application, processing by the other application can be performed efficiently without being influenced by the waveform sample calculation.

Further, because a predetermined number of tone waveform sample values are set as a basic calculating unit and tone waveform sample values are actually calculated on a unit-by-unit basis, it is possible to reduce the overhead spent in preparing for the waveform value calculating processing etc. Furthermore, because a predetermined number of tone waveform sample values are already prepared and stored in memory at a starting point of an automatic performance,